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EDITORIAL

Heating up caesarean care – tackling perioperative hypothermia

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Optimising care for women who undergo caesarean delivery in low- to middle-income settings (LMIC) presents unique challenges, one of which is the risk of perioperative hypothermia, defined as a core body temperature below 36 °C (96.8 °F). Although, caesarean delivery is a relatively short procedure, it has been estimated that inadvertent hypothermia can occur in up to 80% of women who receive spinal anaesthesia.[1] Reasons for this include peripheral vasodilation, diminished regulatory vasoconstriction, and reduced shivering responses that promote heat redistribution during neuraxial anaesthesia, with patients who have higher sensory block levels being particularly vulnerable.[2,3,4] The effect of perioperative hypothermia in women undergoing caesarean delivery has been incompletely studied. However, in the general surgical population it can have significant consequences including increased blood loss, wound infection, cardiovascular complications, and extended hospital stay.[5,6] Maternal hypothermia also has implications for the neonate; this is particularly relevant for caesarean delivery as it has been established that for healthy term neonates, caesarean delivery causes a less favourable thermal response to birth than vaginal delivery.[7] Maternal hypothermia may result in decreases in neonatal temperature and neonatal hypothermia, even in tropical environments. While neonatal hypothermia is rarely a direct cause of death, it does contribute to a substantial proportion of neonatal morbidity and mortality globally.[8,9] The role of minimising unintentional perioperative hypothermia in improving outcomes has been recognised in guidance from the United Kingdom (UK) and United States of America.[10,11]

In this edition of SAJAA, Bishop et al. describe the results of an observational study assessing the occurrence of perioperative hypothermia following spinal anaesthesia for caesarean delivery in a resource-limited setting.[12] The study's primary endpoint was a decrease in temperature of one degree or more from baseline. Using a disposable self-adhesive sensor, the authors report a high incidence of hypothermia, despite the frequent use of preventative measures such as forced air warming and warmed intravenous fluids.

The subject of perioperative hypothermia during caesarean delivery and strategies to prevent and manage was the subject of meta-analyses published in 2015. Sultan et al. evaluated the efficacy of active warming (forced air warming or warmed fluids within 30 minutes of neuraxial anaesthesia placement) on outcomes after elective caesarean delivery.[13] The primary outcome of their study was the maximum temperature change and secondary outcomes included maternal (end-of-surgery temperature, shivering, thermal comfort, hypothermia) and neonatal variables (temperature, umbilical cord pH, Apgar scores). They identified 13 eligible studies, comprising 789 patients (416 warmed and 373 controls), finding that warming significantly reduced maternal temperature change (SMD −1.27 °C [−1.86, −0.69]; $p = 0.00002$). Additionally, it led to higher end-of-surgery maternal temperatures (MD 0.43 °C [0.27, 0.59]; $p < 0.00001$), reduced shivering (RR 0.58 [0.43, 0.79]; $p = 0.0004$), improved thermal comfort (SMD 0.90 [0.36, 1.45]; $p = 0.001$), and decreased hypothermia incidence (RR 0.66 [0.50, 0.87]; $p = 0.003$). Umbilical artery pH was higher in the warmed group (MD 0.02 [0, 0.05]; $p = 0.04$). They concluded that active warming during elective caesarean delivery effectively reduces perioperative temperature reduction, hypothermia, and shivering, supporting recommendations for using forced air warming or warmed fluid during caesarean delivery.

Bishop et al. are to be commended for addressing this important clinical question, shedding light on the subject in a LMIC setting. Consistent with themes in earlier work by the same authors, they again highlight that women should have equity in anaesthetic care regardless of the setting. Maintaining normothermia is an element of enhanced recovery protocols, the implementation of which has been shown to reduce the length of hospital stay in women who deliver by planned caesarean delivery with spinal anaesthesia.[14] Enhanced recovery after surgery protocols have largely been incorporated into practice in high-income settings, but the implementation of these protocols and other perioperative optimisation strategies in LMICs and their impact on the length of hospital stay is unclear. A systematic review and meta-analysis of enhanced recovery after surgery and perioperative optimisation in LMICs, identified six studies for quantitative analysis. Of these, only three reported data on the maintenance of intraoperative temperature.[15]

Although not seen in Bishop's et al. study, one of the primary challenges in LMIC settings is the need for more resources, including proper heating systems and warming devices. Operating rooms may lack adequate temperature control. Recommendations from the UK National Institute for Health and Care Excellence to prevent and manage perioperative hypothermia are divided into preoperative, intraoperative, and postoperative strategies and emphasise that insufficient

preoperative preparation contributes to hypothermia risk.[10] While strategies to reduce perioperative hypothermia frequently focus on intraoperative methods, efforts to maintain normothermia preoperatively play a significant role. Despite generally higher ambient temperatures in resource-constrained settings, there may be a need for warm blankets or other equipment designed to maintain body temperature before surgery, in addition to intraoperative methods. In a study investigating preoperative warming versus no preoperative warming for maintenance of normothermia in women receiving intrathecal morphine for caesarean delivery, Munday et al. demonstrated that preoperative warming was not effective in preventing intraoperative hypothermia.[16] However, individual differences in vasopressor use were not considered in their statistical analysis which limits the interpretation of their results. Vasodilation from spinal anaesthesia is one mechanism contributing to patients becoming hypothermic. This is not a loss of heat per se, but rather a redistribution of heat, or shift in thermal energy from the core to the periphery. The body's heat is not uniformly distributed; heat is usually concentrated in the core region, mainly the head and truncal areas, while the periphery remains cooler.[17] When vasodilation occurs due to anaesthesia, the heat in the core area flows outward towards the periphery, resulting in a core temperature decrease of 0.5–1.5 °C. In patients receiving general anaesthesia, prophylactic infusions of phenylephrine reduce the magnitude of redistribution hypothermia.[18] Therefore, it would seem logical that prophylactic infusions of phenylephrine would also reduce hypothermia during spinal anaesthesia.[19] Notably, preoperative warming has been demonstrated to reduce intraoperative temperature decrease in other surgical populations.[20] Extended surgical time can increase the likelihood of heat loss during surgery. Factors such as difficulty in performing the surgery, unanticipated complications, or a shortage of skilled personnel can contribute to a prolonged caesarean delivery. Healthcare providers in LMIC settings may not be adequately trained or aware of the importance of preventing hypothermia during caesarean delivery. This lack of awareness can lead to oversight and insufficient measures to maintain optimal body temperature.

A limitation of Bishop's study, which is in common with other studies on this subject, is that they did not collect data after discharge from the recovery area. Therefore, it is possible that the incidence and severity of perioperative hypothermia was underestimated. While active warming measures are often implemented intraoperatively to counteract heat loss, the recovery period post caesarean delivery also poses challenges in maintaining normal body temperature. Even with efforts to address hypothermia during the surgical phase, women undergoing caesarean delivery may continue to experience decreased body temperature in the immediate postoperative period. As with preoperative care, timely and effective postoperative warming strategies, such as using warm blankets and maintaining a warm environment, are essential to mitigate the persistence of hypothermia and promote optimal maternal recovery and comfort.

Hypothermia during caesarean delivery in LMIC settings poses a substantial threat to the well-being of both mothers and newborns. Addressing this challenge requires a multifaceted approach, including improvements in infrastructure, education, and the implementation of cost-effective warming strategies. By prioritising maternal and neonatal thermal care, healthcare systems can enhance the safety and success of caesarean deliveries in resource-constrained environments, ultimately improving the outcomes for mothers and their infants.

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